Electricity Cooperation in South Asia:
Barriers to Cross-Border Trade

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Abstract

The South Asia Region continues to face electricity shortages, underinvestment, and rural electrification challenges. Strengthening cooperation for cross-border electricity trade in South Asia makes it possible for the region to take advantage of significant benefits from greater regional coordination in capacity investments. Trade can complement domestic investment to increase the availability and reliability of supply, bringing economies of scale in investments and more cost-effective expansion of renewable electricity. Efforts to expand cross-border electricity cooperation and trade in SAR need to address not only regional barriers, but also barriers stemming from domestic electricity sector policies in the region. Expanding the scope of bilateral electricity cooperation in the short- and medium-term, and especially opening up to commercial as well as government-to-government projects, can build confidence in the process of cross-border trade and the potential benefits it can provide. The longer-term desirable goal is emergence of a well-functioning regional market for electricity, supported by a regional organization or forum for cross-country coordination.

Keywords: South Asia, cross-border electricity trade, power sector reform

JEL Classifications: Q48, G18, N70, F13

1. Introduction

Increased availability of reliable, affordable and cleaner energy can facilitate economic development and improve welfare in the South Asia Region (SAR).[1] Problems in the region include poor access to electricity, combined with unreliable supply due to generation and network capacity shortages and poor maintenance of assets.[2] This, in turn, leads to the use of costly and environmentally harmful small-scale fossil fuel-based back-up generators. Investment in electricity infrastructure and improved system management are key steps for overcoming these problems (Andres et al., 2013a, b; Ghosh-Banarjee et al., 2015).

Another key step is finding ways to take advantage of the significant operational, economic, environmental and reliability benefits of power trading across borders in SAR, advantages that remain largely unexploited (Chattopadhyay and Fernando, 2011). Strengthening cooperation for cross-border electricity trade in South Asia makes it possible for the region to take advantage of significant benefits from greater regional coordination in capacity investments. Trade can complement domestic investment to increase the availability and reliability of supply, bringing economies of scale in investments and more cost-effective expansion of renewable electricity.

[1]In this paper, the South Asia Region (SAR) refers to Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka. Afghanistan and Maldives are in this region as defined by the World Bank, but are not discussed in this paper.

[2]The countries in the South Asia Region are home to 1.57 billion people (23.7% of global population). Around 493 million people lacked access to electricity across South Asia in 2009, despite electricity sector reforms in the region (IEA, 2011). In 2010, average per capita electricity consumption in the region was 563 kWh as compared to the world average of 2977 kWh (Singh et al., 2013).

Increased electricity trade also allows the region to benefit from complementarities in electricity demand and resource endowments due to diversity of primary energy resources and differences in seasonal patterns of supply and demand. In addition, regional cooperation can bring enhanced competition and improved sector efficiency (Timilsina et al., 2015; Singh et al., 2013; ESMAP, 2010; Srivastava and Mishra, 2007; Thakur, 2004). For example, Nepal and Bhutan have comparative advantages in hydropower production that can only be economically harnessed through cross-border trade with other countries, considering the gap between domestic demand and energy generation potential. These two countries also experience significant decline in hydroelectric generation during the winter season, and thus would benefit from improved access to other electricity generation capacity from neighboring countries.

Efforts to expand cross-border electricity cooperation and trade in SAR need to address not only regional barriers, but also barriers stemming from domestic electricity sector policies in the region. The barriers include the lack of cost reflective pricing; shortages in generation capacity; low operational efficiency and service quality; weak utility financial performance; and limited involvement of the private sector. These are relatively familiar attributes of power sectors with limited reforms. Identification of the relevant regional and national scale barriers and discussion of how to overcome them is the main objective of this paper. Our aim is to support appropriate political, policy and regulatory interventions for overcoming the barriers.

The reminder of the paper is structured as follows. Section 2 reviews the status of cross-border electricity cooperation in SAR. Impact of domestic sector weaknesses on cross-border electricity cooperation and trade is discussed in Section 3. Section 4 identifies key regional-

level barriers to expanding cross-border cooperation and trade in SAR. Section 5 summarizes the findings of the paper.

2. Status of Cross-Border Electricity Trade in South Asia

Increased regional energy cooperation and trade fall within the broader domain of regional trade expansion and cross-border market integration. General interest in regional economic cooperation predates the formation of South Asian Association for Regional Cooperation (SAARC) in 1985. The agreement for a South Asian Free Trade Area (SAFTA) signed in 2004 envisioned transition towards a common market. Tangible expressions of interest in regional energy cooperation followed the formation of SAFTA. The South Asia Regional Energy Coalition (SAREC) was formed in 2006 to promote advocacy initiatives by leading policy-oriented business associations in the region. The SAARC Energy Centre (SEC), established in 2006 as a Special Purpose Vehicle (SPV) with its base in Islamabad, Pakistan, also focuses on regional energy sector cooperation in South Asia.

In late 2014, SAARC member states agreed to a "framework agreement" for regional cooperation in electricity.[3] The agreement contains broad-ranging provisions for the establishment of a regional market for electricity, including non-discriminatory access to transmission, market-based pricing of electricity exchanged, and establishment of a body for coordinating regional power integration and trade. It remains to be seen how extensively or rapidly these provisions will be put into practice to achieve the objective of developing the SAARC Market for Electricity (SAME).

[3] See http://www.saarc-sec.org/userfiles/SAARC-FRAMEWORK-AGREEMENT-FOR-ENERGY-COOPERATION-ELECTRICITY.pdf.

Table 1 summarizes the current state of cross-border arrangements for electricity sector trade in South Asia. At present, SAR electricity trade is dominated by India. Simple bilateral electricity trading arrangements are predominant, including arrangements between Nepal-India, India-Bhutan and most recently India-Bangladesh (Singh et al., 2013; Srivastava and Mishra, 2007; Paudyal, 2013). These bilateral relationships are based on government-to-government agreements.[4]

[Table 1 here]

Current electricity trade between Bhutan and India reflects the comparative advantage argument laid out in the introduction to this paper. Bhutan is endowed with significant potential for development of hydroelectricity, which significantly surpasses its domestic needs. The country thus deepened cooperation with India to develop its hydroelectric resources for export purposes.[5] Access to thermal power from India during the dry winter season further highlights mutual benefits of interdependency of the two power systems.

Trade between India and Bangladesh reflects the urgent need in the latter country to reduce capacity shortages, due in particular to increasing scarcity of domestic natural gas for use in its own generating plants. The link between the countries, which went into operation in 2013, has an initial capacity of 500 MW, with possibilities for expansion. A 25-year government-

[4] The private sector is starting to become more involved in cross-border power projects. A number of Indian investors are developing large power projects in Nepal, part of which can serve the export market. A number of power generation projects in Bhutan as well Nepal are witnessing participation of private investors, including those from within South Asia. As of December 2014, 161 mostly small hydro projects (totaling about 2000 MW) have been developed and are under development in Nepal. Most of the small projects are being developed by the private investors.

[5] The Royal Government of Bhutan also gains a minimum 12% royalty from power projects.

to-government electricity purchase deal involves import of 250 MW of coal-fired electricity from India to Bangladesh. Bangladesh also is acquiring 250 MW of power under short-term agreements on India's power exchanges.

The lack of sufficient available generation capacity addition has led Nepal to draw increasing imports of electricity from India. However, Nepal also can become a large net exporter of electricity as the country develops its vast hydroelectric potential. The benefits for Nepal and Bhutan from further developing their large hydropower generation potential include significant improvement in domestic availability of electricity; income flows from electricity export; and access to other power sources in the dry season. The countries buying power from Nepal and Bhutan would benefit by lower electricity costs,[6] displacement of more polluting domestic sources, and the potential for increased system reliability from diversification of sources.

3. Barriers to Increased Regional Electricity Cooperation and Trade Due to National Sectoral Policies

Arguably, the current state and magnitude of electricity cooperation and trade in SAR is far less than the potential considering the regional diversity of energy resource endowments and the differences in demand patterns across countries in the region (Wijayatunga and Fernando, 2013; Singh et al., 2013; Timilsina et al., 2015). Discussion of this issue often focuses on regional-level barriers, which we discuss in Section 4. Here we discuss barriers to increase

[6] Cost of hydro-power generally declines over the lifetime of the plant, whereas variable cost of thermal power plants increases due to increasing cost of fuel and decrease in heat rate.

regional electricity cooperation and trade attributable to weaknesses in domestic sector policies.

3.1 Overview of Power Sector Reforms in South Asia

Countries in the South Asian region initiated national electricity sector reforms following somewhat different approaches and timelines (Table 2).[7] The reforms have been undertaken to address, among others, the fiscal burden of energy price subsidies and low revenue collection rates; and the economic burden of insufficient supply, low service quality, and high network energy losses experienced under largely state-owned and controlled systems (Newbery, 2002; Singh, 2006, 2010). The reform processes in SAR have been aimed at improving the investment climate in order to reduce serious generation capacity deficits, in particular by attracting more domestic and foreign private investments (see Singh, 2007 for discussion of this in the context of India). While reducing dependence on state financial support, reforms also have sought to maintain affordable as well as reliable service quality (Lama et al., 2002).

[Table 2 here]

The single buyer model (SBM) (*one buyer and many sellers*) dominates the wholesale generation market arrangements across the region (Table 2). Only India has introduced a degree of competition in wholesale markets for electricity, and a day-ahead market (Singh 2010; Thakur et al., 2005).[8] Vertically integrated incumbent electric utilities in Pakistan and India have undertaken functional unbundling (Singh et al., 2013). Most of the states in India

[7] A separate appendix containing details on national sector policy changes in individual SAR countries is available on request.

[8] However, parties involved in longer-term bilateral transactions have preference in access to transmission over those obtaining electricity through the power exchanges.

have unbundled the State Electricity Boards (SEBs) into separate corporatized entities for generation, transmission and distribution. Due to a provision of India's Electricity Act 2003, the bulk power procurement activity of the unbundled transmission utilities has been further separated from the provision of transmission across most states. There is evidence that unbundling in India has improved operational efficiency of generation plants (Cropper et al., 2011), though effects are not necessarily realized immediately (Sen and Jamasb, 2012).

Partial unbundling of electricity services has been undertaken in Bangladesh, Pakistan, Bhutan, and Sri Lanka. By law, Bhutan has designated a government entity to be the single buyer of electricity for all power projects, including the private ones. The electricity sector in Bangladesh is horizontally unbundled with separate entities, catering to the requirements of the rural and urban areas. A legislative initiative has been advanced to unbundle the Nepal Electricity Authority. However, the fate of this remains unclear due to the persistent political uncertainty in the country.

The ownership of the generation segment is mixed. There is private sector participation in the form of IPPs in Bangladesh, India, Nepal, Pakistan and Sri Lanka (see Table 3). However, the bulk of generation assets remain state-owned except in India, where the capacity share owned by the private sector is above 40%. Transmission and distribution remain largely under government ownership across the region. In India, private investors are permitted to invest in creation of transmission infrastructure under a license. A number of transmission links have been created in this manner, including one between Bhutan and India which has been constructed under a joint ownership agreement between a private investor and a public-

sector transmission company of India. The Indian states of Delhi and Orissa,[9] and one distribution area in Pakistan (in Karachi), are the only examples of privatized electricity distribution in the region.

[Table 3 here]

Independent regulatory commissions have been introduced in many SAR countries. The process is still pending in Nepal (Nepal and Jamasb, 2012a), and remains partially implemented in Bhutan. More generally, the reform process has been slow in most of the SAR countries. In Sri Lanka, for example, a new Electricity Act was enacted only in 2009. Even in India, where the reform process has operated for almost two decades, the reform process remains intertwined with politics (Singh, 2010; Dubash and Rao, 2008; Tongia, 2007; Singh, 2006).

3.2 Performance of National Electricity Policy Reforms

The electricity reforms in most SAR countries have been aimed mainly at enhancing operational performance, with relatively less specific emphasis on being "market-oriented" (the prevalence of a single-buyer model in the region exemplifies this). India remains an exception by having opened up the sector to competition and adopting market-oriented policies, although this transformation faced a number of challenges (Littlechild, 2013). However, poor operational and financial performance in the electricity sectors of SAR countries continues, reflecting continued weaknesses in the structure and governance of the sector (Bhattacharya, 2007). Key lingering problems with domestic electricity sector regulation in the region include the following:

[9]All four electricity distribution companies in Orissa were privatized (three distribution companies to BSES Ltd, now Reliance Energy Ltd., and one to AES of USA). Due to regulatory and legal issues, however, AES exited the business and the control of that company fell back to the state government.

(i) Lack of cost reflective pricing.

Inefficient pricing has been a major contributor to the financial problems of the publicly owned electric utilities. The inability of the sectors to generate sufficient surplus has affected the ability of the electric utilities to improve the efficiency of operations and invest in capacity addition for electricity generation, transmission, and distribution. It also stunted incentives for private sector entry in generation, even where legal entry barriers have been lowered or removed.

This has been a major contributor to the financial issues of national power sectors. Revenues from tariffs remain insufficient to recover cost of electricity supply (Figures 1 and 2). This is partly made up by government subsidies while the remaining losses continue to strain the financial health of electric utilities. The average cost electricity supply in Pakistan (except Karachi) is higher (PKR 13.50/kWh), as compared to average tariff (PKR 11.50/kWh). The difference is met by subsidy from the government (Bhutta, 2015).

[Figure 1 here]

[Figure 2 here]

(ii) Weak utility financial performance.

In addition to distorted tariffs, revenue inadequacy due to non-collection of payments for services rendered remains one of the major concerns of the state-owned electric utilities in South-Asia. A significant part of this has been attributed to theft by electricity users. In Bangladesh, electricity theft was estimated at 14%. In India, a third of electricity is lost through "nontechnical losses" each year (Min and Golden, 2014). These electricity losses can

involve fraud (meter tampering), stealing (illegal connections), billing irregularities such as non-payment, and corruption (Smith, 2004).

In addition, revenue shortfalls arise from "circular debt" problems. The circular debt arises when an operating entity facing problems with outstanding receivables holds back payments to its suppliers and creditors (Kessides, 2013), in turn creating problems for them in meeting their expenses. Circular debt in turn arises frequently because allowed tariffs for transmission and distribution do not reflect actual costs. In Pakistan, for example, T&D losses that distribution companies are allowed to include in tariff determinations are lower than the actual levels (GoP, 2013). State Electricity Regulatory Commissions (SERCs) grapple with a similar situation in India (Singh, 2006).

The size of these financial shortfalls is remarkable, though some improvement has been occurring. In Bangladesh, for example, accounts receivable due to non-payment of electricity bills was equal to 8.7 months of electricity consumption in 1999- 2000. This improved to about 2 months by 2013-14 in the wake of electricity sector reform (GoB, 2014b). The Nepal Electricity Authority incurred a financial loss of Nepalese Rupees (NPR) 4 billion in 2012 despite a tariff hike (NEA, 2013).[10] This was due in part to substantial "nontechnical losses" (nonpayment of bills by electricity users), as well as to overstaffing and weak management (see subsection (iv) below). The purchase of expensive electricity from India during winter and selling it at subsidized prices also sharply increased NEA financial losses.[11]

[10]One USD = NPR 97, 1 USD = PKRS 98 and 100 INR = 160 NPR (as of May, 2014).

[11] Negotiation between India and Nepal in 2017 (after a six-year hiatus), led to the scrapping of the 5% annual increase in electricity import tariff that was part of the power exchange agreement between the two countries.

During the 1990s, the amounts due by the State Electricity Boards in India to central power sector utilities, coal companies and the railways rose to INR 414.7 billion (GoI, 2001). In 2002, following a one-time tripartite settlement, amounts due began to be securitized by the respective state governments (Singh, 2006).[12] However, mounting debts again plagued state electric utilities due to uncovered losses. The accumulated financial losses of the power sector in India increased from INR 190 billion in March 2005 to over INR 1070 billion by March 2010 (GoI, 2011). Total receivables for the power sector swelled from INR 3100 billion in March 2005 to over INR 5600 billion in March 2010 (GoI, 2011). The net accumulated losses of SEBs and state owned distribution companies before subsidies reached Rs. 1,790 billion before subsidies and Rs. 820 billion after subsidies by March 2010 (Planning Commission, 2011). In some states the arrears were equivalent to well over one year's power consumption.

The distribution sector continues to exhibit serious operational inefficiency as well as financial losses (Pargal and Ghosh Banarjee, 2014). In June, 2015, government introduced Ujwal DISCOM Assurance Yojana (UDAY) to assist financial turnaround of electricity distribution companies (discoms). Under this scheme, the respective state governments took over 75% of discoms' debt as of September 30 of that year (GOI, 2015). The discoms are given stringent performance targets and are supposed to have to bear significant portion of incremental losses.

In Pakistan, the lack of payments has affected various government departments, generation and distribution companies under the control of KESC and Pakistan Electric Power Company (PEPCO), domestic and international fuel suppliers, and refineries in Pakistan. The circular

[12] See also Dossani (2004) for a discussion of the reorganization of the Indian distribution sector.

debt in the power sector had reached PKR 537.5 million in 2011, with the potential to lead to shutdown of generation plants and further worsening of demand-supply imbalances in the power sector (Javaid, 2012). The new government at the time settled the existing circular debt through a one-time government subvention of PKR 480 billion in July 2013. However, the issue re-emerged soon afterwards, highlighting the fact that the underlying causal factors had not been effectively addressed. A report commissioned by the Planning Commission of Pakistan identified the main source to be a difference between the "tariff differential subsidy" (TDS) the government claims to pay to distribution companies and the amount actually disbursed. More recently there has been improvement in tariffs and management in the Pakistani power sector, with support from a major World Bank lending program.

Lower T&D losses have been achieved by the relatively more efficient distribution utilities in India, and in Bangladesh and Sri Lanka. Lack of metering of all consumers remains a challenge for the utilities and the regulatory commissions to arrive at an accurate estimate of network losses, and to separate out non-technical losses from technical losses (Singh, 2006).

(iii) Continued shortages in generation capacity.

The pace of growth in investment in power generation capacity across SAR remains slow; it does not match the growth in electricity demand of existing consumers and that of the new consumers gaining electricity access (Table 3). The result is a large number of rolling power outages (Nayar et al., 2012). For example, some rural areas in Pakistan experienced load shedding and blackouts for up to 20 hours a day in 2012, while Nepal experienced up to 14-hour daily power outages in 2013 (Sovacool et al., 2013). However, since October 2016, the daily blackouts in Nepal have ended rather rapidly after the implementation of a combination of supply-side measures and demand side management measures backed by strong political

support. For instance, the hydropower generation system was overhauled, the provision of around the clock electricity to some industries was ceased, restoration of some idle power plants occurred and a public awareness campaign to promote energy efficiency was launched.[13]

Bangladesh experienced load shedding of 1000-1200 MW in 2011 against a peak demand of 6500 MW (GoB, 2014a). Increase in domestic generation capacity and agreement to import up to 500 MW electricity, which began flowing in October 2013, have eased power shortages in Bangladesh. Sri Lanka, which remains significantly dependent on hydro-electric generation, is prone to electricity shortages during droughts, even though the average shortages remain as low as two hours a day. Peak demand and energy shortages in India declined from 11.5% and 18%, respectively, in 1996-97, to 4.2% and 4.5%, respectively, by 2013-14, as the share of private investment grew to 34% by the end of March 2014 compared to a meager 3.6% at the end of November 1994. Without that increase in private investment, power shortages could have been higher. More recently, many states in India have turned surplus with nationwide power shortages declining significantly even while large generation capacity is in the pipeline.

There are figures indicating that inadequate power supply imposes significant costs on South Asian economies. Table 4 provides an assessment of the direct loss of economic output by electricity users due to electricity outages in South Asian countries, along with other statistics indicating the degree of service unreliability in the region. A study of the Pakistani economy

[13] This happened with the appointment of a new head of the NEA in September 2016. Hence, there is public concern that power cuts will again be routine with the change in governments.

concluded that the cost of load shedding was PKR 1,272 billion in 2011-12, about 6% of the economy (Saeed, 2013).

[Table 4 here]

***(iv) Limited involvement of the private sector*.**

Attracting foreign and domestic capital through private sector participation in the power sector was one of the major objectives of reforms in SAR (Victor and Heller, 2007). Reforms in the region have had some success in attracting private sector participation in power generation, as shown in Table 3 above. Nonetheless, many IPP projects that were built rapidly to address electricity shortages are small in scale and not cost-effective. As noted, private investors in India are permitted to invest in creation of transmission infrastructure under a license, and a number of transmission links have been created in this manner.

Privatization of existing electricity distribution remains a politically sensitive decision throughout the region. The Indian state of Orissa was home to the first experiment, in 1999, with privatization of distribution. The initial hiccups in this exercise postponed further attempts at privatization elsewhere. Privatization of electricity distribution in Delhi, in 2002 was remodeled based on the experience in Orissa: it incorporated performance milestones based on bidding criteria with declining government support. Evidence indicates that these and other privatized distribution companies have achieved considerable reductions in technical and commercial power losses (IDFC, 2010). Privatization of electricity distribution in Karachi faced political hurdles, making it difficult to implement similar measures elsewhere in the country. Nonetheless, there is little happening at present in moving toward broader privatization in the distribution segment.

3.3. *Implications for Cross-Border Electricity Cooperation and Trade*

These continuing challenges due to incomplete domestic power sector reforms negatively affect the prospects for success in cross-border cooperation and trade as well (Belyaev, 2011). The difficulty in recovering costs, whether due to tariff designs or opportunistic conduct of regulators under domestic political pressure, and the potential difficulty in accessing new markets under a single-buyer model, reduce incentives for expanding export-oriented generation investment and limit the reward for expanding cross-border transmission capacity. The expansion of generation capacity dedicated to export may be especially challenging in the face of persistent domestic power shortages. Regulatory distortions complicate long-term contracting for power and make financing of new capacity for cross-border electricity trade more challenging.

From the side of potential buyers in cross-border power transactions, financially weak and inefficiently structured suppliers are less able to provide a desired level and quality of service. This amplifies the inherently higher risks of power purchase agreements across national boundaries (ESMAP, 2008). Sellers also may face political pressure to charge high prices to foreign power purchasers, especially if they are receiving subsidies or there are large circular debts at home.

Limited participation of the private sector has several adverse effects on regional electricity cooperation and trade. Limited domestic competition blunts possibilities for improved operational efficiency and financial sustainability on the part of incumbent firms, thereby exacerbating worries about capacity availability and adequacy of seller performance. It also increases the potential of incumbent utilities to exercise market power as cross-border trade grows. Market power remains an important issue, as national sector reforms have on many

occasions failed to adequately address them (Newbery, 2002). Barriers to entry for new players in a regional market would stall the evolution from government-to-government transactions toward increased competition (Green, 2003).

In addition, strong opposition to opening of domestic markets to foreign imports and the resulting interest in anti-competitive policies and practices, in particular limiting transmission access for foreign suppliers, should not be underestimated (ESMAP, 2010). Finally, inefficient and inertia-bound domestic electricity sector policies and regulatory institutions can impede establishment of the cross-border institutional capacities needed for coordination, especially if domestic authorities focus more on protecting incumbents than expanding markets.

4. Regional Challenges to Electricity Trade in South Asia

Although the scope and extent of cross-border electricity cooperation vary across different parts of the world, regional electricity cooperation and trade initiatives have faced common challenges (Pineau et al., 2004; ESMAP, 2008, 2010; Oseni and Pollitt, 2016). In this section we discuss three important categories of challenges.

4.1. Cross-Border Relations in SAR

Historical animosity or lack of trust has often frustrated the process of regional cooperation in South Asia, including regional power sector cooperation. While there are encouraging signs, political rhetoric for electricity cooperation has not consistently translated into the political will and action for cooperation in South Asia (Paudyal, 2013). In contrast, the success of Bhutan-India electricity cooperation can be attributed to greater political level understanding

leading to mutual trust. In addition, the government-to-government model for cross-border trade typically involves lengthy political as well as technical negotiations. Furthermore, such agreements are also often revisited and renegotiated.

Regional cooperation can be perceived by some as a threat to national safety, energy security, and economic and political sovereignty, as reflected in debates over power trade between India and Pakistan (Mukherji and Chaturvedi, 2013). In another case, inability of the Bangladeshi government to provide a guaranteed supply of natural gas for a proposed USD 3 billion power project investment in Bangladesh by an Indian company resulted in the latter abandoning the business venture altogether (Rahman et al., 2012). On the other hand, entry of Chinese investment has prompted India to explore electricity cooperation with Sri Lanka and Nepal (Chaturvedi, 2013; Mittra, 2012).

The ability of cross-border electricity trade arrangements to effectively address public concerns with respect to social and environmental impacts and distributional fairness of outcomes also has been questioned (Williams and Ghanadan, 2006). For example, large-scale development of water resources in Nepal and Bhutan will generate significant economic rents. Debates over the distribution of such rents can generate strong opposition. Such progress also leads to fears regarding displacement or loss of livelihoods.

4.2 Absence of Regional Mechanisms for Cross-Border Regulatory Coordination

Increased electricity cooperation and trade in the region requires national regulators and system operators to pay more attention to harmonization and coordination of their technical and regulatory practices. Effective cross-border trade requires capacities for tracking electricity flows, ensuring investments in interconnectors, maintaining grid integrity, and

collecting and transferring revenues, among other functions. Operational aspects such as congestion management, operational codes and protocols for system operation, and data transfer protocols need to be gradually harmonized for seamless and stable operation of the transmission systems (Singh et al. 2016).[14]

Still other coordination issues are more policy-oriented in nature. One of these is rules and procedures concerning transmission access and its pricing, since that affects market access. Congestion management also has policy as well as operational aspects. Another important element is resolving disputes, especially in the context of contract performance. Large fixed capital investments for the export market create conditions where, once the investments are sunk costs, a buyer will have strong bargaining power over the owner. This would be particularly important in large-scale hydropower development. The slow pace by India in concluding a power trade agreement with Nepal illustrates the potential hazard if there are not effective cross-border mechanisms to deter opportunistic behavior by power purchasers – and an illustration of how trust in such agreements can be difficult to build up.

The lack of a harmonized framework for electricity regulation, policy and legal arrangements in SAR poses a challenge for long-term success of cross border trade (USAID, 2016). Creating the necessary institutional structure for addressing technical, operational, and policy issues across national boundaries is not easy, as indicated by less than satisfactory outcomes faced in some other regions of the world. However, there are some interesting examples of

[14] Establishing a SAARC level Transmission System Operator (TSO) or Coordination Forum of System Operators is an option as national transmission grids are becoming increasingly integrated. HVDC interconnections, while costly, allow some flexibility due to asynchronous operation of the interconnected power systems.

apparent success. Notable among these is the regional power pool agreement in southeast Europe (Oseni and Pollitt, 2016). Countries in this area have elected not to create a new regional institution per se. Instead, they have found ways to maintain effective coordination in power flows and plans for reducing capacity constraints in the system. The positive outcomes achieved are all the more remarkable when one recalls the intense and bitter political and armed conflicts affecting the region in the relatively recent past.

Nevertheless, how well such experiences can be transferred to SAR remains an open question. As noted previously, SAARC has brought about a political process leading to regional agreements to further electricity cooperation. However, institutional mechanisms to implement policy, regulatory and utility-level coordination on a larger scale are yet to take shape. Saroha and Verma (2013) argue that there is no clear choice of market model that can be adapted to the SAR context.

4.3. Direct and Indirect Barriers to Cross-Border Power Trade

The South Asian Free Trade Agreement (SAFTA), when signed, did not give special treatment to energy, particularly electricity trade. The signing of the SAARC Framework Agreement for Energy Cooperation (Electricity) in 2014 during the 18th SAARC Summit in Kathmandu has given some impetus to regional power trade expansion, but more steps are needed. For example, electricity import licensing restrictions in India that limit participation to specifically identified (so-called nodal) agencies also limit entry in cross-border trade and hinder the development of power exchange. Further, the presence of export tax, import duty, transit tax and slow development of transmission interconnectors hinder trade in electricity (Singh et al., 2013).

Trade-related power sector reforms are also inter-dependent with wider reforms, and failure to harmonize inter-sector reforms can lead to power sector reform measures being ineffective (Nepal and Jamasb, 2012b). Examples include difficulties in concluding a free trade agreement between India and Sri Lanka, and India's reluctance to waive imports duty for imported construction equipment and materials to Nepal from a third country. Similarly, Pakistan is yet to grant Most Favored Nation (MFN) status to enhance trade with India.

5. Conclusion and Policy Implications

This paper has identified and analyzed the barriers to increased cross-border electricity cooperation and trade in SAR. It highlights that lingering distortions from incomplete domestic policy reforms lead to disappointing sectoral performance at the national level. These barriers, also lead to disincentives for potential suppliers and sellers to seek opportunities for economically and environmentally beneficial cross-border regional electricity cooperation and trade.

The key barriers include financial weakness and operational inefficiency of many sector participants, potential barriers to new entrants, and concerns about the extent to which national governments will take the necessary steps to support cross-border trade, especially if they themselves are not the principal parties involved. These problems exacerbate the inherent regional level challenges in expanding power cooperation and trade, such as addressing national security and sovereignty concerns and establishing effective institutional capacities for technical, operational, and policy coordination.

Expanding the scope of bilateral electricity cooperation in the short- and medium-term, and especially opening up to commercial as well as government-to-government projects, can build confidence in the process of cross-border trade and the potential benefits it can provide. It provides a means to learn from experience, and it can catalyze broader sector reforms and development of cross-border capacities, including through sub-regional cooperation (see USAID, 2012).

The longer-term desirable goal is emergence of a well-functioning regional market for electricity, supported by a regional organization or forum for cross-country coordination.[15] Strong political will and policy continuity are crucial for overcoming complex domestic and regional challenges. A key unknown here is whether the potential economic and other benefits will provide enough support to decision makers and the broader public to push this agenda forward.

[15] Singh et al. (2016) identify specific changes in policy and regulatory framework in the respective SAR countries that can lower barriers to regional electricity trade and help usher in a competitive regional power market framework in future.

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Participants	Cross-border electricity trade
India – Nepal	Nepal imported 793GWh electricity in 2013 from India over multiple interconnections.
India-Bhutan	Electricity import from Bhutan to India was 5556 GWh in 2013-14 (4627 GWh in 2012-13) from Hydro power stations at Tala, Chukha and Kurichu with a total export led capacity of 1416 MW. As per an umbrella agreement between the two countries, India assures a minimum of 5000 MW electricity import by 2020.
India-Bangladesh	In 2013, power systems of India and Bangladesh were interconnected through a HVDC line that can support electricity export of up to 500 MW (expandable to 1000 MW in future) from India to Bangladesh based on negotiated price and market based price.
Pakistan-India	Pakistan has submitted a draft MoU to India on importing electricity using a 1200 MW interconnection. There are also possibilities of CASA to be extended to India.
India-Sri Lanka	Feasibility studies for a 400-kV India-Sri Lanka have been conducted to support import of up to 1000 MW electricity from India.

Table 1: Existing and some proposed cross-border electricity trade arrangements in South Asia
Source: Compiled from Singh et al. (2013), NTDC (2014), ERLD (2014)

Country	Generation market structure	Initiation of private ownership and/or participation			Introduction of legally independent regulator	Transmission Arrangement
		Genera-tion	Trans-mission	Distri-bution		
Bangladesh	Multiple sellers, single buyer	1992			2003	Unbundled transmission owner
Bhutan	Multiple sellers, single buyer	2008				Vertically integrated
India	competition with organized trading, but includes SOEs	1991	2000	1999 (Orissa); 2002 (Delhi)	1996 (Orissa); 1998 (National)	Unbundled transmission and independent system operator[a]
Nepal	Multiple sellers, single buyer	1992			1994/2011	Vertically integrated
Pakistan	Multiple sellers, single buyer	1994	1995	1998 (KESC) [b]	1995	Unbundled transmission owner
Sri Lanka	Multiple sellers, single buyer	1996			2002/2009	Vertically integrated

[a] System operator continues to be bundled with the transmission utility at the state-level.
[b] KESC - Karachi Electric Supply Company (now, K-Electric).

Table 2: Status of major reform elements in South Asia
Source: Compiled by the Authors.

	Installed capacity (MW)	Peak demand met (MW)	Peak demand (MW)	Private Sector share in installed capacity (%)	Electricity access rate (%) [a]	Network losses (% of generation)	Per capita electricity consumption (kWh)
Bangladesh	8537	6434	8349	16.35	60	14.36	213
India[d]	243028	126793[e]	131943[e]	34.0	75	23.65	917
Nepal	720	569.6[b]	1094.6	33.33	76	25.03	106
Pakistan	23412	13445	18467	35.56	69	17	450
Sri Lanka	3312	2112[c]	2146	33.15	85	14	490

Notes: [a] IEA (2011); [b] excludes electricity imports capacity from India; [c] based on 1.2 GW hydro plant not running during drought seasons; [d] As on March 2014; [e] For March 2014.

Table 3: Power sector performance indicators in several South Asian countries

Sources: Bangladesh (BPDB, 2014); Nepal (NEA, 2013); Sri Lanka (CBSL, 2013), India (CEA, 2014); Pakistan (Kessides, 2013)

Country	Economic value lost by enterprises due to electrical outages (As a percentage of sales)	Average time of outages per month (hours)	Percentage of firms citing electricity availability or reliability as a major or severe constraint for growth	Percentage of firms owning generators
Afghanistan (2007)	6.4	280	66	71
Bangladesh (2007)	10.6	113	78	52
Bhutan (2009)	4.3	8	6	18
India (2006)	6.6	---	32	41
Nepal (2009)	27.0	226	76	16
Pakistan (2007)	9.2	69	74	26
South Asia (overall)	10.7	139	53	43

Table 4: Loss of economic output due to electrical outages and impact unreliable electricity supply on business activity
Source: World Bank (2013) and Nayar et al. (2012)

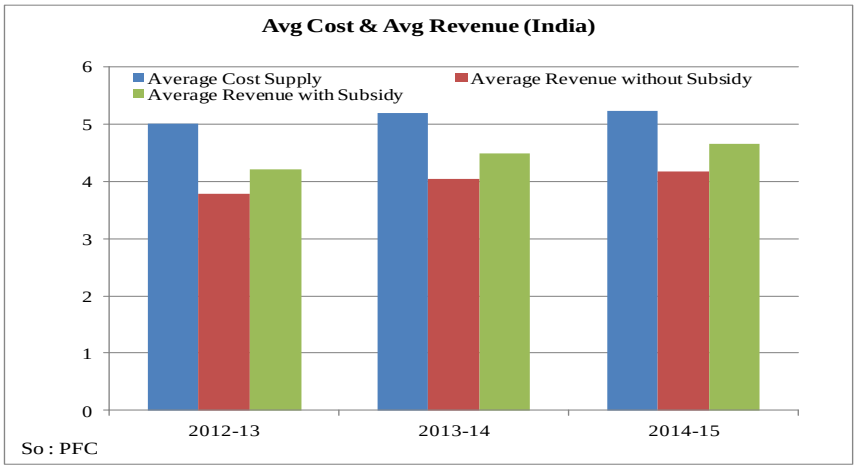

Figure 1: Average Cost and Revenue in India

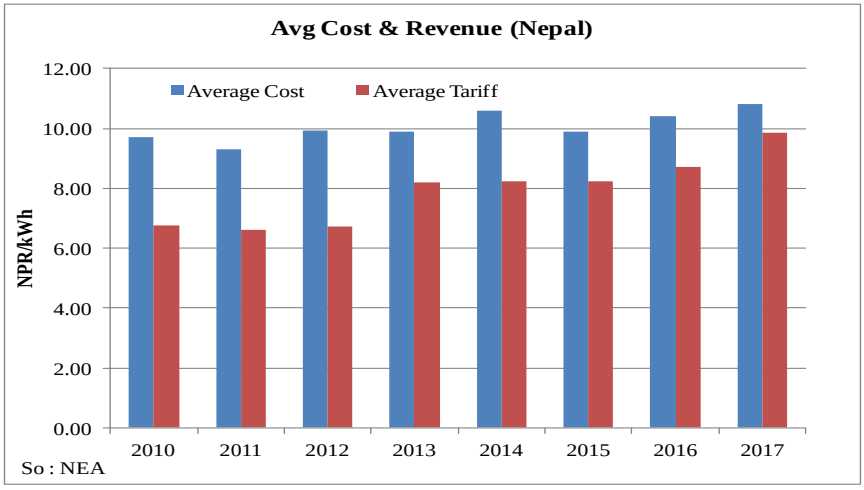

Figure 2: Average Cost and Revenue in Nepal

Source: NEA (2013, 2014, 2015, 2016, 2017)